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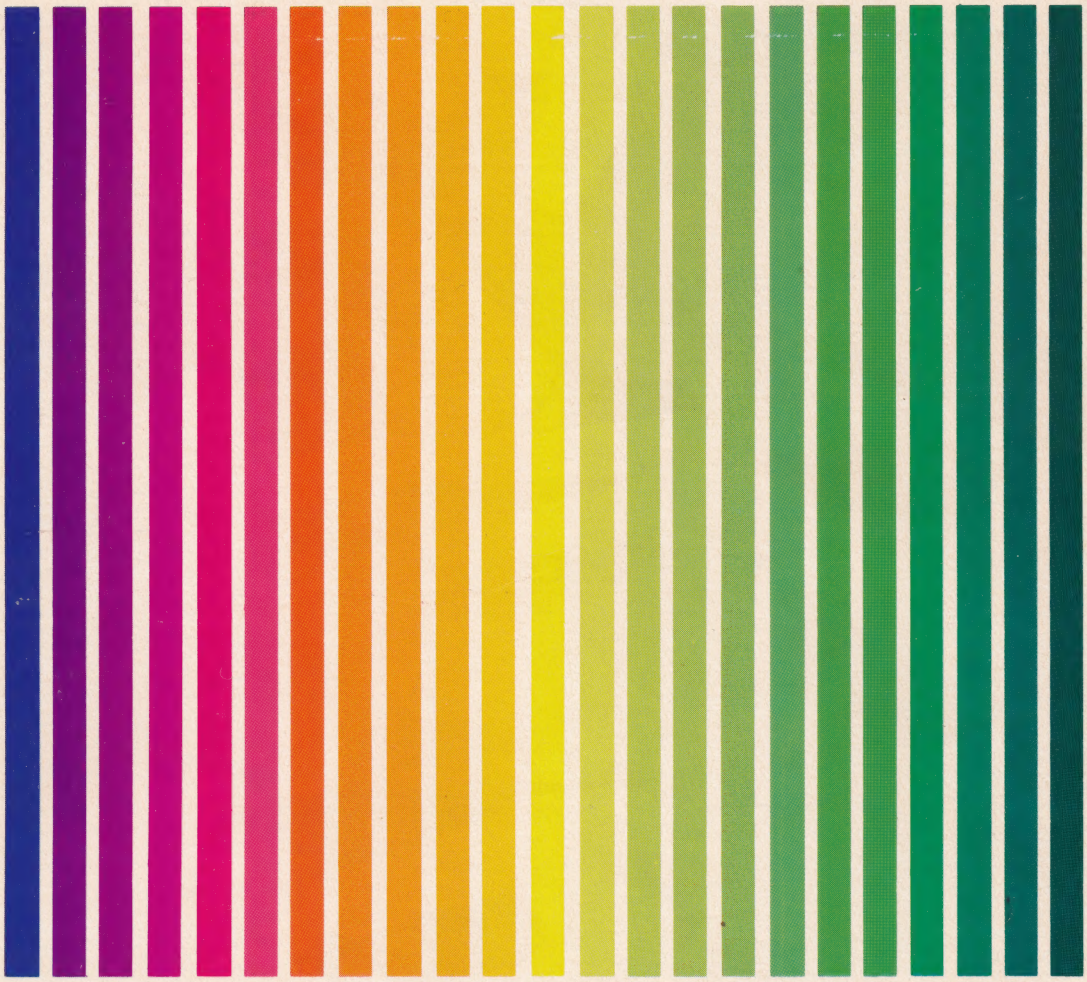

CLYDE SPENCER JUNE 1982

ISOPLETH MAP-MAKING PACKAGE

DISKETTE (APX-20103)
REQUIRES: 32K RAM

User-Written Software for ATARI Home Computers

ISOPLETH MAP-MAKING PACKAGE

by

Clyde Spencer

Program and Manual Contents © 1982 Clyde Spencer

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INTRODUCTION

OVERVIEW

Using the ISOPLETH MAP-MAKING PACKAGE, you can create isopleth maps representing numerical data you enter into the computer. The data can be any that vary with location, such as elevation, ore concentrations, mineral content, population density, or air pressure. The generated maps use isopleths, which are lines that connect points of equal value, to give you a graphic representation of your data. This program gives you a simple way to generate such maps without the tedious and often subjective "hand contouring" usually used.

ISOPLETH MAP-MAKING PACKAGE contains three programs, MFILEGEN, ISOMAP, and COLORPLT

MFILEGEN allows you to enter and store up to 99 sets of data having three variables.

ISOMAP uses the stored data to create isopleth maps. The maps are generated on the monitor and printer, and stored on diskette. ISOMAP actually interpolates the entire map from the random data that you entered using MFILEGEN. Since this process takes up to an hour, the output is automatically written to a diskette which saves you the trouble of rerunning ISOMAP to redisplay the map.

COLORPLT quickly regenerates the maps on your screen or printer that have been already processed by ISOMAP.

Four sample files are included so you may become familiar with the uses of the programs before you tackle your own projects.

REQUIRED ACCESSORIES

32K RAM
ATARI BASIC Language Cartridge
ATARI 810 Disk Drive

OPTIONAL ACCESSORIES

Any ATARI printer or equivilant printer

GETTING STARTED

SETTING UP

1. Insert the ATARI BASIC Language Cartridge in the cartridge slot of your computer.

2. Turn on your disk drive.

3. When the BUSY light goes out, open the disk drive door and insert the ISOPLETH MAP-MAKING PACKAGE diskette with the label in the lower right-hand corner nearest to you.(Insert it in disk drive one if you have more than one drive.)

4. The program will automatically load into your computer.

THE FIRST DISPLAY

After the program loads, the screen displays a menu listing the three programs. After a few seconds, a prompt asks you to enter the program number you will use. Press 1 to run MFILEGEN, 2 to run ISOMAP, 3 to run COLORPLT, or 4 to end the program. The program will then stop and it must be reloaded. After you select the program, the screen displays the title of the program. After a few seconds, the program asks for input.

USING THE PROGRAMS

Be sure your diskette contains all three programs. You will not be able to run the programs if one is missing. You may exit any of the three programs by pressing the START key at the end of the program, or duing the display of the title screen. You then return to the menu.

You must use a separate data diskette, formatted with DOS II. Be sure to insert it after the profram you are using loads.

Problems encountered during processing, such as a missing file, or an incorrect spelling, generate one of the standard ATARI Disk Operating System or Operating System I/O errors.The system will either stop and require restarting, or will, in some cases, restart itself.

COLORPLT

Let's start with COLORPLT since it's the quickest way to see just what these programs do.

COLORPLT recreates the screen display or printer output of files processed by ISOMAP and

stored on diskette, without taking the 45 minutes or so needed by ISOMAP to create the map. To run COLORPLT, select 3 on the menu display. A blue and orange lettered title screen displays briefly. A blue text screen follows, with the prompt, "INPUT FILENAME?". Next you must insert your data diskette. Then you enter the file name (which must end in ".MAP".) of a data file previously processed by ISOMAP.

The program next asks "DO YOU WANT PRINTER OUTPUT?". Type "YES" or "NO", and press the RETURN key. Be sure you have the printer turned on if you type "YES", otherwise you will be asked "DO YOU WANT PRINTER OUTPUT ?" until the printer is on. The program then displays the map on the screen, and on the printer if you're using it. When the map is complete, press the START key to return to the menu.

The screen display of the map includes a key describing the colors and their relative value. Color range 1 is equal to the smallest data value entered. Range 2 is equal to the contour interval plus the smallest data value. Range 9 equals the largest data value. The printer displays the numbers corresponding to the colors, giving you a numerical map rather than color map of your data. Reinsert the program diskette to continue.

Sample Maps

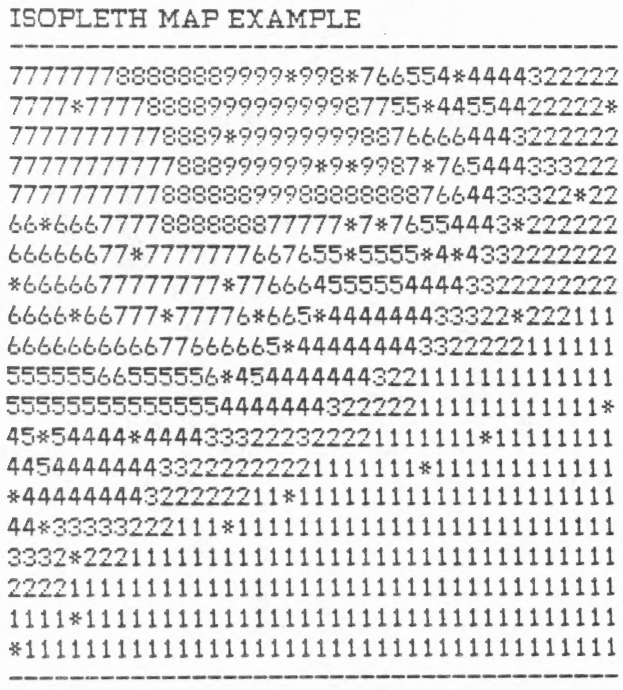
Included on your diskette are two sample files for use with COLORPLT.

To use the first sample file, type "COAST.MAP" when "INPUT FILENAME?" displays. Type "YES" when asked "DO YOU WANT TO USE THE PRINTER?", if you have a printer attached and turned on.

The program will produce a display on the screen of a hypothetical coastline with a steep slope, and a maximum elevation of 270 feet above sea level. Simultaneously, the printer will produce the printout shown in Figure 1.

This map was generated from 40 random data points taken from a portion of an example topographic map prepared by the U.S. Geological Survey. Figure 2 shows that map.

To use the other sample file, type "GOLDPPM.MAP" when the "INPUT FILENAME" prompt displays. This map is an example of geochemical data used with the program. The data were obtained from Fischer and Fischer (1968). The study was geochemical sampling for gold in the San Juan Mountains of Colorado, in the vicinity of Telluride. The printer output of the map is shown in Figure 3. Figure 4 is the map of the area from which the data were taken.



CONTOUR MAP OF COAST
REF. CONTOUR (Z/1)=30
INTERVAL=30
* - IS POSITION OF A SAMPLE POINT

FIGURE 1

TOPOGRAPHIC MAP OF COASTLINE

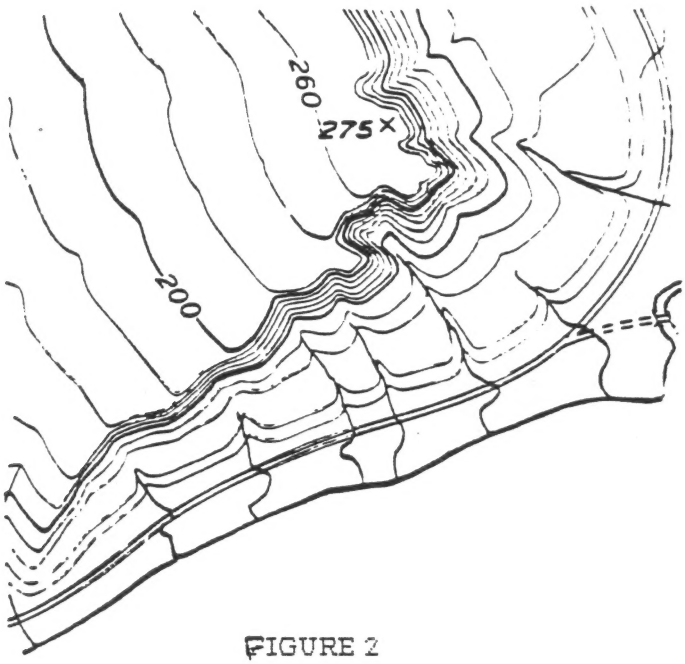
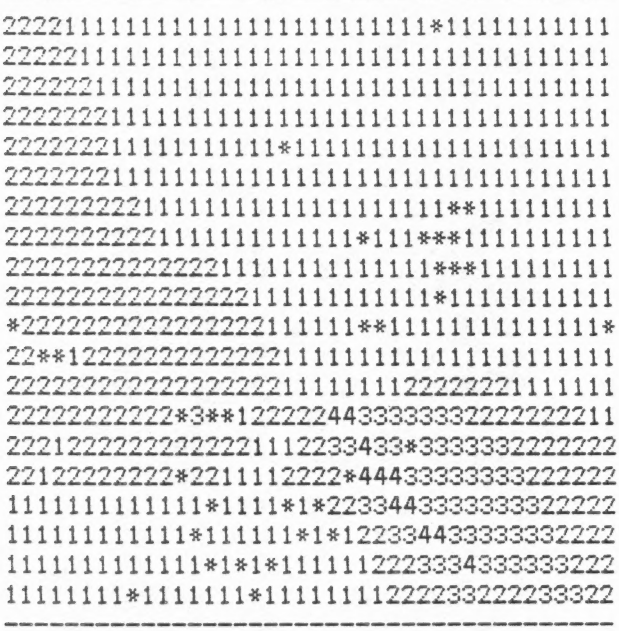


FIGURE 2

SAN JUAN MOUNTAINS GOLD STUDY



MAP OF GOLD DISTRIBUTION IN PPM
REF. CONTOUR (2/1)=30
INTERVAL=20
*-IS A POSITION OF A SAMPLE POINT

FIGURE 3

MAP OF SAN JUAN MOUNTAINS GOLD STUDY

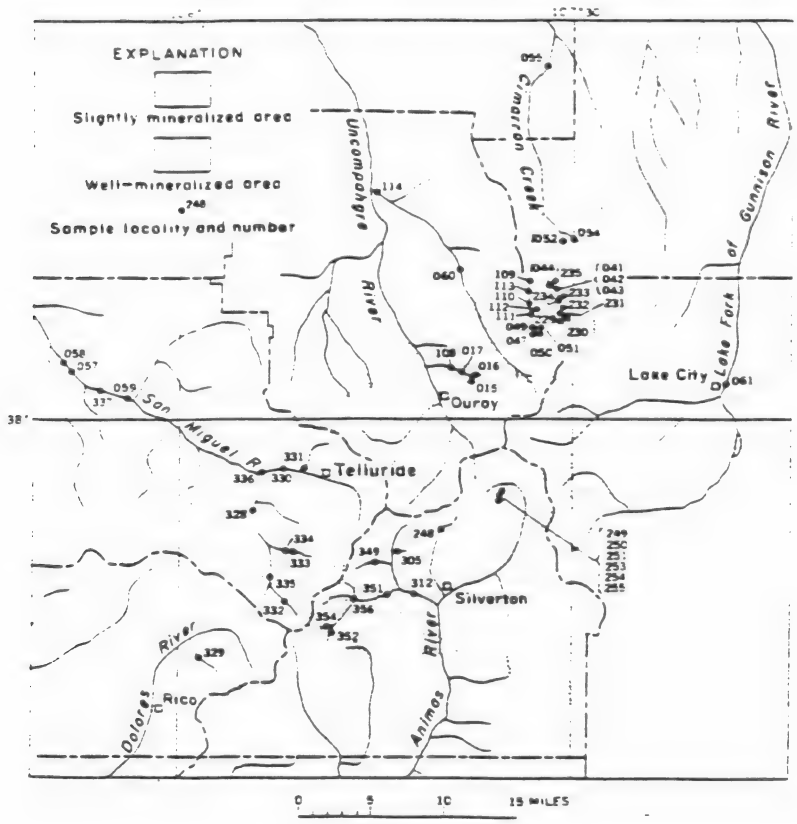


FIGURE 4

ISOMAP

ISOMAP interpolates data entered by using MFILEGEN to create isopleth maps. To run ISOMAP, press 2 on the menu display. A blue and orange lettered title screen is displayed briefly. A blue text screen follows, with the prompt, "INPUT FILENAME?". Here you type the name of a file (which must end in ".DAT".) you have created by using MFILEGEN. Be sure that you have inserted the data diskette before you proceed.

The program next asks "DO YOU WANT PRINTER OUTPUT?". Type "YES" or "NO", and press the RETURN key.

The next prompt is "DO YOU WANT STANDARD CONTOURS?". Enter "YES" or "NO", and press the RETURN key. The Standard Contours are at intervals of 1, 2, or 5 times a power of 10. That results in contours of 1, 2, 5, 10, 20, 50, 100, 200, and so on. Data is rounded up to the next contour level. Typing "NO" gives you the Exact Contour option. These contours are calculated from your data, and are displayed to the nearest 1/10 of a unit.

The screen now goes blank. So you know that everything is functioning properly, once every minute the buzzer in the console sounds, and, for a few seconds, the screen

displays the map created to that time. The message,"I'M WORKING ON IT.", displays to let you know the data is processing. During this time, the printer also prints data.

In about 45 minutes, the buzzer sounds several times and a short message indicates that the job is done. The screen then displays the results of the program, an isopleth map. The printer generates a numerical representation of the same map. The processed data file is automatically stored on the diskette. The name assigned to the file is displayed after "CONTOUR MAP OF", below the map. This is the name used when you entered the data in MFILEGEN. The processed data is given that name plus the extender ".MAP" when stored on the diskette. Reinsert the program diskette to continue.

Sample Maps

Two sample files for using ISOMAP are included on your disk. To use one of the sample data files, type "TOPOMAP.DAT" at the "INPUT FILENAME?" prompt. Choose the printer option, if you are using a printer. When asked, "DO YOU WANT STANDARD CONTOURS" prompt, type "YES". Figure 1, the sample for COLORPLT, uses exact contours, so choosing Standard Contours will let you compare the two choices.

To use the other sample, type "SANJUAN.DAT". This file contains the data used for creating the San Juan Mountains gold study map as shown in Figure 3.

MFILEGEN

Use MFILEGEN to enter and store your data for creating maps using ISOMAP. Enter a 1 on the menu to run MFILEGEN. A blue and orange lettered title screen displays briefly. A blue text screen follows, with the prompt,"OUTPUT FILENAME?". First, insert the data diskette, and then enter the file name for the data you are about to enter. The name can be up to eight uppercase characters, followed by a three character extender, if wanted. This file name is also used when you run ISOMAP for the data you enter with this file.

The program next asks for "MAP TITLE?". Use any descriptive title up to 38 characters in length.

The program asks for "MAP SUBJECT?" next. Choose this label carefully since it is both a description of what is being contoured on the isopleth map and the name of the processed data file to be used later by COLORPLT. The name must contain no more than eight uppercase characters, and must start with an uppercase letter. Don't use an extender, since .MAP is automatically added by the program.

The program next asks for the "NUMBER OF DATA SETS?". You may now enter the total number of points you will use to create your map. A maximum of 99 data points may be entered, but 30 to 50 are normally adequate for most situations. Increasing the number of data points increases the processing time!

Next the program displays "DATA POINTS (X,Y,Z) #1?". Enter the X,Y,Z coordinates for your data on one line, separated by commas, and press the RETURN key. The X and Y coordinates

should correspond to location coordinates of your data. (Hint-Choose X coordinates so they range from 0 to 19.5 units, and Y coordinates with a range of 0 to 19 units. This results in the row and column of a point corresponding to the original X and Y values.) Use the Z coordinate to represent your measurements which you wish to have mapped. These can be data for elevation, ore concentrations, water table depth, magnetic anomolies, weather data, demographics, political surveys, or any other measurements that vary by location. Choose units that are appropriate for your study.

After you have entered the last data set, the program automatically terminates. Completion is indicated with a "FILE CLOSED" remark and a confirmation of the number of data points entered. You are next asked if you wish to enter another data file. Type "YES" if you have another file to enter. If not, reinsert the program diskette and type "NO". Control then passes back to the menu.

You can print the data you have stored to check it for accuracy. To verify the values entered, press the 4 key when the menu displays. When the READY prompt appears, insert your data diskette, type "DOS" and press the RETURN key. After the DOS menu is presented, enter "C", and press the RETURN key. When you are asked "COPY-FROM, TO?", enter the full file name followed by a comma, an uppercase P and a colon (e.g. D1:EXAMPLE.DAT,P:). Be sure your printer is on! To return to the menu after your file has printed, insert the program diskette and press the SYSTEM RESET key. The menu will appear on the screen.

ADVANCED TECHNICAL INFORMATION

This package of programs was inspired by work originally done by Davis (1973) and Till (1977). The basic algorithm is little changed.

Occasionally, some of the calculated map point values may seem incorrect, especially if there is an extreme Z-value, or if the Z-values change rapidly, such as with a steep gradient. The Z-value of each map point is derived from the four nearest data points, and is a distance-weighted mean value. This may result in the apparent innaccuracy. However, considering the small number of data points used to generate the maps, the results should be considered a generalization, and not an exact contour map.

When the nine contour ranges are assigned, the lowest value of range 1 is set equal to the smallest sample value. The boundary between ranges 1 and 2 is equal to the contour interval plus the smallest sample value. The highest value in range 9 is set equal to the greatest sample value.

The actual colors observed vary from one TV screen to the next and even with different tint and color settings on the same TV! For that reason, a color key is plotted alongside the isopleth map. The approximate colors observed should be dark blue background, grey (range 1) , various greens and oranges for ranges 2 through 8, to a bright magenta for range 9. Ranges 2, 4 and 7 have colors that are striped with the background color and the display color. The locations of original sample points are shown in background color on the screen and with an asterisk (*) on the printout.

The "exact" contour intervals are displayed to the nearest 1/10th of a unit. The "standard" contour interval option rounds values up to the nearest power of 10 times 1, 2, or 5. Hence, an "exact" contour interval of 27.3 would become 50 with the "standard" option chosen.

The X and Y values for the raw data may have any positive value. The output is a grid of numbers consisting of 40 columns and 20 rows, which is approximately square. The original map-grid or graph used for sampling should be chosen so that the X-values have a range from 0 to 19.5 units and the Y-values have a range from 0 to 19 units. With this convention, a one to one correspondence is created between a given row and the position of the original sample Y-coordinate. Similarly, each column on the map corresponds to 1/2 unit of the original X-coordinate system. This convention should simplify interpretation of the isopleth map.

Sample files SANJUAN.DAT and GOLDPPM.MAP are included on the diskette. They are examples of geochemical data used with the contouring program. The information was obtained from Fischer and Fischer (1968) and represents the results of geochemical sampling for gold in the San Juan Mountains of Colorado in the vicinity of Telluride. (See Figures 3 and 4.)

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Davis, J.C., 1973, Statistics and Data Analysis in Geology: John Wiley, N.Y., 550 pp.

Fischer, R.P. and Fisher, F.S., 1968, "Interpreting Pan-Concentrate Analyses of Stream Sediments in Geochemical Exploration for Gold", U.S.G.S. circular 592: U.S. Geological Survey, Washington, D.C., 9 pp.

Till, Roger, 1977, "Programs in BASIC for Non-Linear and Multivariate Least-Squares Methods (with worked examples)": University of Reading (England), Geology Dept., Report no. 12.

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ATARI PROGRAM EXCHANGE

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1. Name and APX number of program _____

2. If you have problems using the program, please describe them here.

_____

_____

_____

3. What do you especially like about this program?

_____

_____

_____

4. What do you think the program's weaknesses are?

_____

_____

_____

5. How can the catalog description be more accurate and/or comprehensive?

_____

_____

6. On a scale of 1 to 10, 1 being "poor" and 10 being "excellent", please rate the following aspects of this program?

_____ Easy to use
_____ User-oriented (e.g., menus, prompts, clear language)
_____ Enjoyable
_____ Self-instructive
_____ Useful (non-game software)
_____ Imaginative graphics and sound

7. Describe any technical errors you found in the user instructions (please give page numbers).

8. What did you especially like about the user instructions?

9. What revisions or additions would improve these instructions?

10. On a scale of 1 to 10, 1 representing "poor" and 10 representing "excellent", how would you rate the user instructions and why?

11. Other comments about the software or user instructions:

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